REMARKS

Applicants appreciate the thorough examination of the present application, as evidenced by the Official Action of January 21, 2004. In response, Applicants have cancelled Claims 1 and 5-8. Applicants have also rewritten Claims 3, 9, 12, 13, and 14 in independent form, and amended Claims 3 and 9 to include recitations not described or suggested by the cited references. In addition, Claims 10 and 11 have been amended to depend from Claim 9, and Claims 2, 4, and 15-18 have been amended to depend from Claim 14. Accordingly, Applicants respectfully request allowance of all of the pending claims for the reasons that will be described below.

Zhong et al. Is Not Prior Art

Claims 2-4 and 9-18 stand rejected under 35 U.S.C. §102(a) as being anticipated by Zhong et al.

Applicants submit that the Zhong et al. reference is not prior art under § 102(a) because it is Applicants' own work. Authors Zhong, Hong, and Misra are co-inventors on the present application. As described in more detail in the Rule 132 Declaration of Veena Misra, Ph.D. (submitted herewith), authors Suh, Lazar, and Heuss merely provided experimental data for the studies described in the Zhong et al. reference and were included as co-authors in recognition of their contribution, pursuant to accepted academic courtesy and practice. Suh, Lazar, and Heuss, however, did not contribute to the conception of the present invention. Accordingly, as Zhong et al. is Applicants' own work, this publication was not "before the invention thereof by the applicant for patent" (*see In re Katz*, 215 USPQ 14 (CCPA 1982); MPEP § 715.01(c)), and, thus, is not prior art under § 102(a).

For the reasons described above, Applicants respectfully request withdrawal of the rejections on this basis.

Claim 3 Is Patentable Over Fonda et al.

Claim 3 as amended stands rejected under 35 U.S.C. §102(a) as being anticipated by Fonda et al. (hereinafter "Fonda"). Claim 3 as amended recites:

3. An integrated circuit electrode comprising:
an alloy comprising a first metal and a second metal having lower work function than the first metal, wherein the first metal is selected from the group consisting of Co, Pd, Rh, Ir, Pt, Au, Re, Os, RuO_2, IrO_2 and alloys thereof and wherein the second metal is selected from the group consisting of Mn, Mg, V, Cr, Y, Zr, La, Gd, Sm, Pr, Nb, Al, Hf and alloys thereof.

Applicants submit that Fonda does not teach the use of a Ru-Ta alloy as "an integrated circuit electrode" as recited by Claim 3 as amended. Indeed, as described by Fonda et al. at Col. 9, lines 6-8: "The primary utility of these alloys would be as sensors, actuators, fasteners, and vibration dampeners which can operate in elevated temperature environments." As such, Fonda makes no mention of a Ru-Ta alloy as an electrode. Also, Claim 3 as amended does not recite the elements Ru and Ta, and further includes a list of metals which do not appear to be described in Fonda. Accordingly, Fonda does not disclose all of the recitations of Claim 3 as amended, as is required for a rejection under §102. For at least these reasons, Applicants respectfully request withdrawal of the rejections based on Fonda.

Claim 14 Is Patentable Over IBMTDB 8/88

Claim 14 stands rejected under 35 U.S.C. §102(a) as being anticipated by IBM Technical Disclosure Bulletin Vol. 31, No. 3, August 1988 (hereinafter "IBMTDB"). Claim 14 recites, in part, "...a first gate electrode...and a second gate electrode...to provide a multiple gate integrated circuit field effect transistor."

Applicants submit that IBMTDB contains no mention of a second gate electrode along with the first gate electrode "to provide a multiple gate integrated circuit field effect transistor," as recited by Claim 14. As such, IBMTDB does not disclose all of the recitations of Claim 14, as is required for a rejection under §102. Claim 2 as amended depends from Claim 14, and is thus patentable over IBMTDB for at least the same reasons. Accordingly, Applicants respectfully request withdrawal of the rejections based on IBMTDB.

Claims 3, 9, and 14 Are Patentable Over Lee et al.

Claims 3, 9, and 14 stand rejected under 35 U.S.C. §102(a) as being anticipated by Lee et al. (hereinafter "Lee").

Claim 3 as amended recites, in part, "an alloy comprising a first metal and a second metal...wherein the first metal is selected from the group consisting of Co, Pd, Rh, Ir, Pt, Au, Re, Os, RuO_2, IrO_2 and alloys thereof and wherein the second metal is selected from the group consisting of Mn, Mg, V, Cr, Y, Zr, La, Gd, Sm, Pr, Nb, Al, Hf and alloys thereof." The cited portions of Lee disclose a composite metal gate formed of a first metal layer 7, which may include "alloys of elemental metals such as RuTa , TiNi." *See* Lee, Col. 5, lines 27-41. However, Claim 3 as amended does not recite the elements Ru, Ni, Ta and/or Ti. As such, Applicants submit Lee does not appear to describe the specific alloys recited in Claim 3 as amended. Accordingly, Lee does not disclose all of the recitations of Claim 3 as amended, as is required for a rejection under §102.

Claim 9 as amended recites, in part, "[a]n integrated circuit...wherein the second gate electrode comprises an alloy comprising Ru and Ta and having different amounts of Ru relative to Ta than the first gate electrode." Support for Claim 9 as amended may be found in the specification at Page 10, lines 20-23:

> The work function of this [Ru-Ta] alloy can be varied from 4.2eV to 5.2eV, according to some embodiments of the invention, by controlling its composition, thereby enabling its use in both NMOS and PMOS devices according to some embodiments of the invention. (*Emphasis added*).

The Official Action states that "Lee teaches in columns 5 and 6 that NFETs may have gates of RuTa and PFETs may have gates of other alloyed metals." *See* Official Action, Page 3. (*Emphasis added*). As such, Applicants submit that Lee does not appear to disclose a second gate electrode comprised of the same alloy (i.e. Ru-Ta) as a first gate electrode, but "having different amounts of Ru relative toTa," as recited by Claim 9 as amended. Thus, Lee does not disclose all of the recitations of Claim 9 as amended, as is required for a rejection under §102. Claims 10 and 11 as amended depend from Claim 9, and are thus patentable over Lee for at least the same reasons.

Claim 14 recites, in part, "...a first gate electrode...and a second gate electrode...to provide a multiple gate integrated circuit field effect transistor." The cited portions of Lee discuss CMOS devices with a first composite metal gate for an NFET, and a second composite metal gate for a PFET. *See* Lee, Col. 5-6. However,

Applicants submit that Lee does not appear to disclose first and second gate electrodes between the same set of source and drain regions "to provide a multiple gate integrated circuit field effect transistor," as recited by Claim 14. As such, Lee does not disclose all of the recitations of Claim 14, as is required for a rejection under §102. Claims 2, 4, and 15-18 as amended depend from Claim 14, and are thus patentable over Lee for at least the same reasons.

For the reasons described above, Applicants respectfully submit that Claims 3, 9, and 14 and all claims dependent therefrom are patentable over Lee. Accordingly, Applicants respectfully request withdrawal of the rejections on this basis.

Claim 14 Is Patentable Over Tsunashima et al.

Claim 14 stands rejected under 35 U.S.C. §102(a) as being anticipated by Tsunashima et al. (hereinafter "Tsunashima"). As discussed above, Claim 14 recites, in part, that the "gate electrode comprises an alloy" and "a multiple gate integrated circuit field effect transistor."

Applicants submit that Tsunashima does not teach an electrode which comprises "an alloy comprising a first metal and a second metal having a lower work function than the first metal." Rather, as described by Tsunashima at Col. 11, lines 47-60, "the gate electrode of the N-type MIS transistor is formed of a laminate structure consisting of the hafnium nitride film **113** and the cobalt film **115**...the work function of the hafnium nitride film **113** is about 4 eV; whereas the work function of the cobalt film **115** is about 5 eV." (*Emphasis added*). As such, Tsunashima does not appear to disclose a gate electrode comprising "an alloy" of a first and second metal, as recited by Claim 14.

Further, Applicants submit that Tsunashima does not disclose "a multiple gate integrated circuit field effect transistor." Tsunashima describes CMIS transistors with a first and second laminate gate for an N-type and a P-type transistor, respectively. As such, Tsunashima does not appear to disclose first and second gate electrodes between the same set of source and drain regions "to provide a multiple gate integrated circuit field effect transistor," as recited by Claim 14.

Thus, Tsunashima does not disclose all of the recitations of Claim 14, as is required for a rejection under §102. Claims 2 and 15-18 as amended depend from Claim 14, and are thus patentable over Tsunashima for at least the same reasons. Accordingly, Applicants respectfully request withdrawal of the rejections based on Tsunashima.

Claims 12 and 13 Are Independently Patentable

Applicants respectfully submit that Claims 12 and 13 are independently patentable over the cited references. Claim 12 recites, in part, "[a]n integrated circuit...wherein the first gate electrode comprises an Ru-Ta alloy having between about 40% Ta and about 54% Ta and wherein the second gate electrode comprises an Ru-Ta alloy having less than about 20% Ta." Claim 13 recites, in part, "wherein the first gate electrode comprises an Ru-Ta alloy having at least about 30% Ta and wherein the second gate electrode comprises an Ru-Ta alloy having less than about 30% Ta."

Applicants submit that the specific percentage ranges recited by Claims 12 and 13 do not appear to be disclosed or suggested by any of the cited references. Applicants further submit that the combination of Ru and Ta within the recited ranges can yield unexpected results. For example, as illustrated in Figure 11 of the present specification, the work function of a Ru-Ta alloy exhibits linear behavior when the percentage of Ta is less than about 30%. However, where Ta is increased greater than about 30%, the work function exhibits non-linear behavior. As described by the present specification:

> [F]or layers with at. % Ta less than about 20%, Ru-like properties may be expected such as a large work function and excellent thermal stability film. Similarly, layers with at. % Ta more than about 70% may be expected to exhibit Ta-like properties. However, when the at. % Ta concentration is between about 40% and about 60%, a new single phase is obtained...This suggests that Ru_xTa_y films have work functions that may be appropriate for both NMOS and PMOS devices.

See Specification, Page 13, line 22 to Page 14, line 18 (*Emphasis added*).

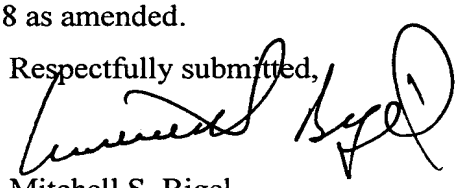
Thus, the specific ranges recited by Claims 12 and 13 provide unexpected results which are neither disclosed nor suggested by the cited references.

Accordingly, Applicants respectfully submit that Claims 12 and 13 are independently patentable over the cited references.

Conclusion

In view of the above, Applicants respectfully request favorable examination and allowance of Claims 2-4 and 9-18 as amended.

Respectfully submitted,

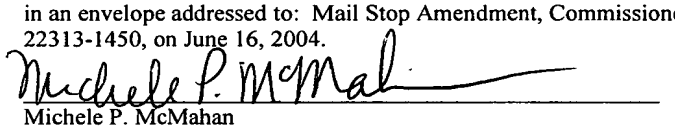


Mitchell S. Bigel
Registration No. 29,614
Attorney for Applicants

Myers Bigel Sibley & Sajovec, P.A.
P. O. Box 37428
Raleigh, North Carolina 27627
Telephone: (919) 854-1400
Facsimile: (919) 854-1401
Customer No. 20792

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: Mail Stop Amendment, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on June 16, 2004.



Michele P. McMahan
Date of Signature: June 16, 2004